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Pascal Schillings[*]

Abstract: *»Als erste am Südpol. Die Produktion geographischer Fakten während der norwegischen Antarktisexpedition, 1910-12«.* This article seeks to open a so-called black box. It asks how the information that Roald Amundsen reached the South Pole in December 1911 became accepted as a 'matter of fact' that found its way into most overviews of the 19th century. To open this black box, the article examines the techniques and strategies that the Norwegian Antarctic expedition of 1910 to 1912 applied to produce its data. It argues that the Norwegian expedition applied at least three different techniques: Optical instruments were used to come as close to the pole as possible and encircle it; landmarks were left around the pole to turn the British expedition that followed the Norwegians at the pole into eye-witnesses; in Europe, the tables of geographical data that Amundsen had noted in his journal were recalculated to affirm its accuracy. Two observations follow from the focus on the expedition's practices: Firstly, the Antarctic landscape and its climate were vital actors in the production of geographical data in the Antarctic. Secondly, the Norwegian strategy was markedly more defensive than the black-boxed sentence about its presence at the pole suggests: It relied on a combination of techniques to ascertain, and aimed at proximity rather than a claim to have been at the pole.

Keywords: Antarctic exploration, epistemic strategies, geography in the making, 'matters of fact', Roald Amundsen.

1. Introduction[1]

The Norwegian polar explorer Roald Amundsen reached the Geographical South Pole in December 1911. This seems to be a 'matter of fact' and as such belongs to general knowledge, just as it is inseparably linked to the tragic fate of the British expedition led by Robert Falcon Scott that arrived at the pole only weeks later: "Amundsen of Norway reached the South Pole in 1911, one

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month ahead of the hapless British Captain Scott" (Hobsbawm 1987, 18) writes, for instance, Eric Hobsbawm in *The Age of Empire*. References to Amundsen's arrival at the pole frequently occur in overviews of the nineteenth century, the Norwegian expedition with its remote destination usually being taken as the endpoint of a century of geographical exploration of the world. After Amundsen's arrival at the South Pole, so the argument, there were no blank spots left on the map (Hobsbawm 1987; Osterhammel 2009; Rosenberg 2012).

In its brevity, which is of course a characteristic of overviews, the sentence that Amundsen arrived at the South Pole serves as a placeholder for all the information that it leaves out – for instance that Amundsen, of course, was not alone at the pole, but accompanied by four other members of his expedition. It seems to be left to the various turns of historical research to add new perspectives and details to the short declaration. An approach focussing on *human-animal relations* might, for instance, point to the fact that the Norwegians were not alone at the pole, but had with them 18 polar dogs – 34 others had already been killed on the way to the pole, and by the time the Norwegians returned to their base station, only eleven were left.[2]

New perspectives like the focus on animals would create more detailed accounts, but would not in principle challenge the notion that Amundsen reached the South Pole in December 1911. This sentence might thus be regarded as a *black box*: It conceals the complicated mechanisms and techniques that were necessary to establish it as a 'matter of fact', and instead only displays – in the handy format of a simple sentence – the outcome of these processes (Latour 1987). Yet that it was, and still is, generally accepted – even by people who did not sympathise with Amundsen's expedition – that Amundsen was at the point in the Antarctic that by mathematic convention became the South Pole, a place far removed from the inhabited world regions, raises the question, what strategies he used to convince the geographical and wider public of his accomplishment. To answer this question, it is necessary – to stay with the image – to open the *black box*, and take into consideration 'geography in the making.'

Investigating into the strategies and techniques of producing geographical knowledge, it will be shown in the following, sheds light on yet another ensemble of actors present at the pole, apart from humans and dogs, that was necessary to generate this knowledge and its claim to truth: It was only through the use of a variety of things, ranging from optical instruments over tent poles to letters and tables of data, put down in notebooks, that the Norwegians could prove their presence at the pole. This broad scope of things widens the range of objects usually studied in the history of science. While research commonly either investigates into the objects of research – the *epistemic things* (Rhein-

[2] The killing of the dogs even left its trace on the Antarctic map: The place where the Norwegians killed 27 dogs, and which they therefore referred to as Butchers' Shop, maintained this label. Butcher's Spur lies on 85° 34' S. / 166° 30' W.

berger 1997) – or into the instruments and technological apparatuses used to work on those (Warner 1990; Taub 2011), things, such as tent poles, fit into neither of these categories.

The reason for this, it will be argued, is that the Norwegian expedition applied different strategies to turn their accomplishment into a 'matter of fact.' Partly, it relied on its instruments to locate its position and thereby produce facts that adhered to the logics of a "mechanical objectivity" (Daston and Galison 1992, 82) – according to Lorraine Daston and Peter Galison the standard methodology of attempts at being true to nature since the middle of the nineteenth century. To convince their contemporaries, however, they combined instrumental strategies with a technique that Steven Shapin, for the work of Robert Boyle in the seventeenth century, described as "witnessing science" (Shapin 1984, 487). Amundsen's expedition, it will be argued, turned the British explorers that arrived at the South Pole later into eye-witnesses of their success. To do so, they installed landmarks, for instance tent poles, in the vast and monochrome Antarctic landscape to inform the British of their success.

For the production of knowledge – or: 'matters of fact' – in the Antarctic, it will further be argued, that the interaction between these things and their physical surroundings, was central. Following the Norwegian expedition on its journey to the pole and back to Europe, three practices of producing 'matters of fact' are discussed with a focus on their specific relation between environment, objects, and human actors: The way to and the arrival at the pole were characterised by instrument-based methods that might be regarded as approximation and encircling. At the pole, the Norwegians left markers in the landscape to integrate the British expedition as eye-witnesses into their strategy. In Europe, Amundsen handed his notebook over to astronomers, to have the Antarctic observations recalculated. Before turning to the Norwegian expedition, however, it seems necessary for a moment to reflect on the methodological background of these considerations.

2. 'Geography in the Making'

Speaking of 'geography' rather than 'science in the making' pays tribute to the contemporary discourse, and later evaluation of Amundsen's expedition, which sometimes sharply distinguished between science and geography to devaluate the Norwegian accomplishment. Gordon Fogg, for example, describes the Norwegian expedition in his *History of Antarctic Science* as "a meticulously planned, professionally executed and successful dog-sledge journey to the South Pole with a minimum of science" (Fogg 2005, 126). This seeming absence of science, however, should not suspend approaches investigating into the techniques of generating knowledge. On the contrary, it seems time to transfer the interest in practices of knowledge production from its context in

science studies and the history of science to case studies outside the traditional realm of the natural sciences.

Laboratory studies have, since the 1970s, pointed out the importance of the practical aspects of knowledge production (Pickering 1992). The insight behind this was that scientific knowledge production was a process that could not adequately be described or understood if only the outcome was taken into account. Instead, it was felt an image of 'science in the making' needed to be created to highlight the uncertainties, controversies, and negotiations that characterise scientific knowledge production (Latour 1987). This led *science studies* to a methodology of thick descriptions of *Laboratory Life* (Latour 1986; Knorr Cetina 1981) and experimental processes, which have, broadly speaking, produced two major insights. Firstly, comparative studies led to the discovery of a principle disunity of science (Galison 1996; Dupré 1993; Clarke 1998): Different natural sciences use different strategies to produce knowledge. The scientific field is, as Karin Knorr-Cetina argues, divided into *epistemic cultures* with their own distinct practices (Knorr-Cetina 1999).

Adding a historical perspective to this, research has shown how these strategies were historically variable: For Boyle in the seventeenth century, knowledge was empirically based, if it was attested by eye-witnesses – authority could be multiplied "by multiplying witnesses" (Shapin 1984, 488). In the nineteenth century, attempts at objectivity aimed at a diminishment of human influence. Natural phenomena were considered captured most objectively if they were automatically recorded by self-registering mechanical instruments (Daston and Galison 1992). The introduction of a new regime of producing matters of fact, however, did not mean that older technologies were completely replaced by new ones. Instead, it will later be shown that in regard to the Norwegian Antarctic expedition, they coexisted, and were strategically combined to add to the authority of geographical matters of fact. Concerning *epistemic cultures*, this indicates that practices do not only differ from discipline to discipline, but that each culture might also operate – diachronically and synchronically – with a set of historically variable strategies.

The second insight from *science studies* is that research demonstrated that not only human scientists, but also their instrumental equipment and the objects of their research have an impact on the results of research. This argument has later been transferred to a more general sociological level and reformulated several times as *actor-network-theory* (Latour 2007). In the context of science and knowledge production, however, the importance of things for the production of scientific results has been realised much earlier. Francis Bacon, to give just one example, wrote in 1620 about devices that "aid the immediate actions of the senses." Among those, he mentioned "evoking devices that reduce the non-sensible to the sensible; that is, make manifest, things not directly perceptible, by means of others which are" (Bacon in Hacking 1983, 168). Turning to the broader context of Antarctic exploration, the European exploration of the

world at the end of the long nineteenth century, there are two observations that follow from these glimpses at *science studies*.

Firstly, the interest in techniques and strategies of producing knowledge that characterises much of the research in *science studies* has only very sporadically been transferred from the hard sciences to other disciplines. The main foci of historical research on geography in the nineteenth century, for instance, are Geographical Societies as institutions on the one hand (Schröder 2011; Driver 2006), and – after the *spatial turn* – maps or spatial imaginations as the results of geographical knowledge generation on the other hand (Harley 1988). Maps, however, are only the end products of geographical activities; to rephrase Latour: they are 'ready-made geography' rather than 'geography in the making.' It therefore seems necessary to take one step back, and have a look at the techniques and practices through which geographical knowledge is produced, and which as their outcome have maps.

This may also alter our view of the maps themselves. For a long time, maps were regarded as relatively neutral cartographic representations. Since the 1980s, and especially in the context of the European colonial and imperial exploration of the world, the ideological elements of mapmaking have frequently been highlighted. Power structures, so the argument of this field of research, are inherently inscribed into maps (Harley 1988, 1989). By reading maps, "spaces become fair game for control and exploitation as territory" (Edney 2003, 66). Unquestionably, this perspective produced stimulating findings, but taking into consideration mapmaking in the context of 'geography in the making' might lead to different results. The map that Amundsen asked Norwegian astronomers to draw of his polar expedition represents a carefully constructed illustration that primarily had the aim to convince the geographical public that he had reached the pole.

The second observation is connected to this: If the focus is directed toward 'geography in the making,' the crucial role that objects have for the generation of knowledge becomes obvious. Optical instruments, for instance, allow for an orientation, and the data they produce can be transferred into locations on the map. If Bacon's apparatuses made the invisible visible, the instruments that the Norwegian expedition used worked the other way around: By observing the visible – for instance the height of the sun – they gave information on the invisible, the abstract geographical system of coordinates. Other devices were then again used as landmarkers to make this invisible system visible again for the explorers following the Norwegians: Flagpoles and tents were among these things.

The use of different epistemic strategies and the various objects connected to them were all part of an overall scheme to convince the geographical community of the expedition's achievements. The South Pole is a remote place, and to prove that they were there, the Norwegians documented their observations carefully and turned the British expedition into the eye-witnesses of their success. The expedition was, by some commentators, labelled a dash for the pole,

and as such was exceptional in the longer history of the geographical exploration of the world. Its aim was not cartographic surveying, but the arrival at a point that was at the same time physical and the result of an abstract discourse. As the latter, it only existed in maps because of the establishment of a system of lines of longitude and latitude. In its capacity as a physical place, it did not in the least differ from the plains of snow that surrounded it. Because of this, it seems reasonable to apply Shapin's term of the 'matter of fact': Rather than generate new knowledge, the aim of the Norwegian expedition, it might be argued, was to establish it as a undoubtable 'matter of fact' that they had reached the South Pole.

One might easily argue that this exceptional interest in reaching a point that was known as to be of no value to either science nor commerce, was primarily motivated by considerations of national or imperial prestige. Incorporating polar expeditions into national discourses very frequently constituted an important element of these undertakings, and the polar expeditions that were carried out on the *Fram* constituted an important part in the formation of the Norwegian imagined community after the dissolution of the union between Norway and Sweden in 1905.[3] However, the focus of this article is not on this ideological context, but on the strategies and techniques of the production of geographical matters of fact, and the instruments that were connected with them. For this, the Antarctic seems to be the ideal environment – because of its emptiness, and the distance to the inhabited parts of the earth.

This focus leads back to Bacon and the instruments that make the invisible visible: Firstly, of course, it was only through the instrumental measuring that the Antarctic landscape – or at least its representations in maps – was made it visible for a geographical and wider audience. More importantly for the explorers, however, was the fact that without their optical instruments, with which they could find their position in the network of longitudes and latitudes, they would have been completely disoriented. Roald Amundsen explained the difficulty of not only locating ones position in a landscape without natural markers, but also of moving through it in the proper direction:

> It is no easy matter to go straight on a surface without landmarks. Imagine an immense plain that you have to cross in thick fog; it is dead calm, and the snow lies evenly, without drifts. What would you do? An Eskimo can manage it, but none of us (Amundsen 1912a, 212).

In the white unmarked landscape, the location of the position was possible only with the help of instruments.

[3] The museum in which the *Fram* is exhibited, attracted 18,000 visitors in the year of its foundation 1936, and around 280,000 in 2009; see <http://www.frammuseum.no/Visit-the-Museum.aspx>.

3. Instruments/Approximation and Encircling

The focus of this article is not on the *Fram* expedition as a whole, but only on the journey of a smaller party of five men and 52 dogs to the Geographical South Pole. This expedition was undertaken on four sledges, all of which were equipped with sledge-meters, compasses, sextants, and artificial horizons. Sledge-meters were running wheels that were fastened to the rear side of the sledges, which registered rotations, and thus indicated the distance travelled. With sextants, the angle between the sun and the horizon could be measured, which produced data that could then be converted into determinations of one's position. The instruments, with all the uncertainties that, for instance, atmospheric disturbances caused, led the expedition to the South Pole. One might therefore easily think of them as devices of a mechanical objectivity. Yet this image needs some qualification.

Before coming to the journey itself, it is necessary to take into consideration the relationship between the physical surrounding of the Antarctic and the instruments the explorers used. The conditions of science – or at least data collection – in the field (Kuklick and Kohler 1996) posed some problems and it would therefore be too simplistic to assume that the explorers with the help of their instruments were able to produce spatial data without any difficulties.

Instead it is necessary to include the Antarctic landscape and climate as an actor into the expedition network. The instruments reacted to the south polar conditions. It is therefore plausible to argue that the Antarctic space and weather took an important role in the decision which instrument to use when. An example for this was the use of the compasses: Some of these were spirit compasses, in which the compass rose moved in a container filled with ethanol. Amundsen had asked the instrument maker to use spirit as pure as possible, but he did not follow this request and diluted the alcohol. The result of this was that the spirit compasses did not work when the temperature sank below –40°F, because at this point the liquid froze (Amundsen 1912a, 87). The expedition experienced these temperatures during one of the depot-laying excursions, and was thus aware of the problem before the southern journey began. The compasses, however, did not only react to the Antarctic cold, but also with other equipment, if things were not carefully kept apart. During another depot trip, the explorers realized that one of the compasses that had been reliable before, suddenly went wrong. They found their mistake in the evening, when they saw that the compass lay close to the bag in which they kept scissors, pins, and needles (Amundsen 1912a, 245).

To return to the impact of the Antarctic climate: Spirit compasses were not the only instruments that were sensitive to the influence of the weather. The use of sextants was only possible when the view of the sun was not blocked. In fog or heavy snow, the explorers were thus deprived of any means of fixing their

position or finding the proper direction. Amundsen noted about the day they realised that the liquid in the spirit compasses froze:

> The weather had become very thick, and we could only guess vaguely the position of the sun. Our progress under these circumstances was very doubtful; possibly we were on the right course, but it was just as probable – nay, more so – that we were off it (Amundsen 1912a, 384).

Instead of travelling on in a direction they were not sure about, the Norwegians decided to pitch their camp and wait for the weather to improve.

Very frequently, though, the explorers encountered favourable conditions, and thus made steady progress. The journey can be regarded as an instrument-based attempt at coming as close to the pole as possible. Despite all the difficulties and uncertainties that the interactions between environment and instruments caused, it was an endeavour aiming at 'mechanical objectivity': This was, as indicated above, to a certain degree less a matter of believing in the superior objectivity of the instruments, but a necessity in a landscape that hardly allowed for well-founded human estimations. At the same time, the explorers showed "the taut concentration required for precise observation and measurement, endlessly repeated around the clock" (Daston and Galison 1992, 83). Their determination at producing exact geographical data, one might thus argue, had two motives: It was the only way to ascertain their location, and an indispensable argument, if they wanted to convince the public of their success.

On 14 December, after about fifty days of travelling, they calculated that the South Pole would be within reach of a day's march. The following day, therefore, they carefully observed the sledge-meters, and stopped when the wheels indicated that the distance missing was covered. This stop was only a very rough first approximation, the outcome of combining the last position that had been fixed, and the distance that had been travelled in the direction indicated by the compasses – "our pole by reckoning," as Amundsen called it (Amundsen 1912b, 121). The expedition leader explained:

> Of course, every one of us knew that we were not standing on the absolute spot; it would be an impossibility with the time and the instruments at our disposal to ascertain that exact spot. But we were so near it that the few miles which possibly separated us from it could not be of the slightest importance (Amundsen 1912b, 121).

The Norwegians were not only satisfied that they had reached the pole, it also gave them great relief that they found the surrounding area of the pole untouched. Two days earlier, Amundsen had speculated about the arrival at the South Pole: "What should we see when we got there? A vast, endless plain, that no eye had yet seen and no foot yet trodden; or – No, it was an impossibility" (Amundsen 1912b, 118). The impossibility that Amundsen referred to was the British *Terra Nova* expedition led by Scott – an expedition that had been announced and started before Amundsen revealed his decision to travel south. By following Scott, who had given notice on his plan to reach the South Pole,

Amundsen had turned the expeditions into a race (Huntford 2009). Although the Norwegians were convinced that their mode of travelling was faster than the British style of *man-hauling*, they were far from certain as to the progress of the British expedition.

On the south polar plain, the feeling of relief that they experienced was thus closely connected to the fact that they found the surrounding of the pole unmarked. This might also explain the further course of action. For the symbolic gesture of claiming the polar plateau and the South Pole, the first approximation seemed sufficient for the Norwegians. After congratulating each other on their achievement, the explorers "proceeded to the greatest and most solemn act of the whole journey – the planting of our flag" (Amundsen 1912b, 122). "The historic event" (ibid.) was celebrated the way ceremonies of this kind had been performed across the globe, except maybe for the fact that Amundsen insisted that all five explorers should plant the flag together. In the short ceremony that the Norwegians performed, the fact that they considered themselves close to, but not at the Pole was neglected. Amundsen wrote that the flag "waved over the Pole," and that it was "the first at the geographical South Pole" (ibid.). In an act of symbolically claiming the south polar plain, he gave it the name King Haakon VII's Plateau.

The flagpole erected, however, did not only bear symbolic depth, and display the winner in the race for the South Pole. It was also an object incorporating knowledge: The first marker of the south polar landscape. The significance of marking the landscape will later be returned to. Marking, however, was not only directed outward; it also had a private side: On the evening of the same day, the explorers had what Amundsen called a festivity, which consisted of a meal of seal meat, and began engraving their equipment: "Everything we had with us had now to be marked with the words 'South Pole' and the date, to serve afterwards as souvenirs" (Amundsen 1912b, 124). Amundsen, for instance, had brought with him a pipe that already "bore inscriptions from many places in the Arctic regions" (ibid.).

After the symbolic procedure, the explorers returned to their routines and the techniques of attempting to come as close to the South Pole as possible. This endeavour consisted of a twofold technique: Firstly, they tried to establish their position with the help of the sextant. All five followed the course of the sun, and calculated that they were in 89° 56' southern latitude. The result pleased the explorers, because it would allow them to proceed to the second technique: the encircling of the pole. The Norwegians acknowledged that it was impossible to exclude all uncertainties from in the observations they undertook, as atmospheric disturbances made it impossible to determine the exact position of the pole. Therefore, they decided to encircle the position of their camp "with a radius of about twelve and a half miles" (Amundsen 1912b, 125). This did, however, not mean that they undertook a march with the radius mentioned. Instead, "[t]hree men went out in three different directions, two at right angles

to the course we had been steering, and one in continuation of that course" (Amundsen 1912b, 126).

The encircling was combined with another act of marking the landscape, as the explorers left flags at the ends of their marches on the imagined radius. As flagpoles they used spare sledge-runners of twelve feet in length which they would not need for the return journey. Amundsen considered them strong enough to withstand the polar weather. To these flagpoles they fastened square flags of windproof, dark coloured fabric, "which could be easily seen at a distance" (Amundsen 1912b, 126). Further, they sewed small bags of the same material, in which they put a piece of paper on which they wrote the position of the camp. The flags thus fulfilled two purposes: Firstly, they were markers of the landscape, and containers of geographical knowledge – material representations of the invisible coordinate system. Secondly, they were the result of strategic considerations: As it was impossible to determine the exact position of the South Pole, the safest strategy was to span a polar plain in which the South Pole would lie.[4]

As three explorers started for the encircling, two remained at the camp to determine its position as accurately as possible by a series of observations. Already the first of these observations showed that the Norwegians had left the meridian they thought they had been travelling on. Observations continued from 6 a.m. to 7 p.m., and Amundsen asserted that from these, they were able to find their latitude and the direction of the meridian "with some degree of certainty" (Amundsen 1912b, 128). The result of the observations was that the camp was in 89° 54' 30'', rather than in 89° 56' South – the position that the first observation at the camp had produced. The South Pole was thus further away from the camp than expected. The group drew two conclusions from this: Firstly, it meant that the Geographical South Pole lay within the plain they had spanned between the flagpoles. Secondly, it seemed possible to come closer to the pole than the position of the camp: The instruments would allow for a closer approximation. The Norwegians calculated that the pole was ten kilometres (five and a half geographical miles) away, and they decided to cover this distance "and get our position determined as near to the Pole as possible" (Amundsen 1912b, 129).

The next day the group continued, as Amundsen stated, "to the pole itself" (Amundsen 1912b, 130). This last journey south was a copy of the procedures performed at the first polar stop. After ten kilometres, they stopped to build up their camp. At this place, they undertook observations for twenty-four hours,

[4] Safest is to be understood here as from a strategic perspective. In practice, the undertaking was very risky, as the explorers could not take the heavy sledge-compasses, and therefore could only orientate themselves by the position of the sun. A sudden change of weather to snowing would not only have made this technique of orientation impossible, but also would have obliterated the traces of the way back to the camp.

from which Amundsen concluded that the expedition was "not on the absolute Pole, but as close to it as we could hope to get with our instruments" (Amundsen 1912b, 132). Two members of the expedition volunteered to march another seven kilometres (four miles) in the direction of the newly found meridian, "[i]n order if possible to come a few inches nearer to the actual Pole" (Amundsen 1912b, 132).

The explorers were well aware of the shortcomings of an approach that solely relied on mechanical objectivity in a surrounding that made the practices of gathering exact data very difficult. Repetitions of observations were one way of minimizing uncertainties, yet, the explorers still retreated to a technique of encircling the pole, rather than making claims at exactitude. It therefore seems hardly surprising that the Norwegians used other practices to ascertain their presence at the South Pole as a geographical matter of fact. To do so, they incorporated the British expedition that would follow them at the pole as eye-witnesses into their argument – a practice, as will be shown, that relied on completely different objects than the instrumental encircling.

4. Marking the Landscape/Creating Eye-Witnesses

Apart from the combination of approximation by instrumental measuring and encircling, the Norwegian explorers used another strategy to produce truth: the evidence from eye-witness accounts. That they found the polar plain unmarked made it probable that the British expedition would arrive at the pole later. After the race for the North Pole, which had taken place a few years earlier, a conflict about the winner had evolved, which appeared as almost impossible to solve, as one side had destroyed the record that otherwise would have served as evidence for the other (Bloom 1993). To avoid a similar situation at the South Pole, Amundsen used landscape markers, which would turn the British expedition into witnesses for his success.

The mechanical objectivity of the observations undertaken on the polar plateau was supposed to convince the geographical public through technological accuracy. Turning the British expedition into eye-witnesses of the Norwegian success would increase the credibility of the data. This practice, one might argue, was a relic from the history of science. Shapin describes how Boyle attempted to produce matters of fact by having authoritative witnesses for his experiments. The production of matters of fact in experiments, Shapin writes, "depended not only upon their actual performance, but essentially upon the assurance of the relevant community that they had been so performed" (Shapin 1984, 487). Science was thus "a collective enterprise […], the reliability of testimony depended crucially upon its multiplicity" (Shapin 1984, 487). In Amundsen's case, the number of witnesses was extremely limited: It was only the British expedition that he could hope to reach the South Pole to be witness

to his success. At the same time, this, of course, increased the authority that their testimony would have.

At their first polar camp, at 89° 54' 30'' South, the Norwegians arranged part of the equipment they would no longer use as a marker. Travelling for the rest of their journey with two sledges, they left one set upright in the snow. To increase it in height, they screwed a sledge-meter to it. Together with a number of empty provision cases this construction made, in Amundsen's words "a splendid mark" (Amundsen 1912b, 129). In pencil, he left the message on one of the cases that the final Norwegian polar camp called Polheim would be found "five and a half geographical miles north-west quarter west by compass from the sledge" (Amundsen 1912b, 130).

At Polheim, the Norwegians left a tent that they had brought in case their expedition would have needed to be divided. The tent was made of the same gabardine as the flags of the polar plain, and secured against the wind on all sides. Its dark colour "made it easily visible against the white surface" (Amundsen 1912b, 133). Further, a pole was fixed to the tent-pole to increase its length to thirteen feet, and to which a Norwegian flag and a pennant with the name of the ship *Fram* was attached. As a last proof of their presence at the pole, the Norwegians fastened a tablet to the pole inside the tent, on which they left their signatures. Arguably as important as the tent as a marker in the landscape were the things that the expedition left for the British expedition to find: Apart from gloves and reindeer-skin foot-bags, there was a sextant to verify the data that the Norwegians had produced, and a letter to the Norwegian king Haakon VII.

In this letter, Amundsen gave a report on the geographical findings the Norwegian expedition had accomplished. The explanation that he gave for depositing the letter was that "[t]he way home was a long one, and so many things might happen to make it impossible for us to give an account of our expedition" (Amundsen 1912b, 133). Amundsen added to this report a letter to Scott, who, he thought "would be the first to find the tent" (Amundsen 1912b, 133), and whom he asked to forward his message to the Norwegian king. Markus Krajewski writes in this context about the two world historical postmen Amundsen and Scott, and that through their journey, even the South Pole received its postal address (Krajewski 2006, 291). Yet, this approach was also a serious strategy to produce eye-witnesses for the Norwegian arrival at the pole. The letter took such a central position in Amundsen's strategy that he even mentioned it in his lecture at the *Royal Geographical Society* after his return. Concerning the letter he explained in London that "the next man will bring it home" (Amundsen 1913, 12) – which was, of course, to be Scott.

With a short delay, the strategy proved successful. The tent and the flagpoles became for the British the first proves of their defeat, and for Amundsen's determination of the South Pole. On 16 January, Scott noted in his journal: "The worst has happened, or nearly the worst" (Scott 2008, 375). Henry

Bowers, one of the members of the expedition, detected what he at first considered a cairn or a sastrugus, but which shortly after turned out to be one of the Norwegian dark-coloured flags: When, only the day before, he had high hopes that his expedition could be the first at the pole, Scott now noted in his journal: "This told us the whole story" (Scott 2008, 376) – a formulation that tellingly sums up how knowledge can be inscribed into objects. Instead of the discovery of the South Pole, Scott now wrote about "the shock of discovery" of the flag-poles.

Two days later, the British arrived at Polheim, which they considered one and a half miles from the Pole. Scott noted: "In the tent we find a record of five Norwegians having been there," (Scott 2008, 377), also giving the names as written on the tablet. The Norwegian strategy to mark the South Pole and turn the British into the eye-witnesses of their success worked out well: Scott accepted his role and confirmed the Norwegian success at the South Pole as a geographical matter of fact: He took the letter to the Norwegian king with him, and left a note, saying that he, together with the other expedition members had visited the tent. Apart from the flags and the tent, the Norwegians had unintentionally left other markers in the landscape: The British followed the tracks of the Norwegian sledges in the direction they considered to be South.

Discouraged by their finding, they nonetheless undertook their own observations, and left a Union Jack at the place, which they determined to be the Geographical South Pole. This lay close to one of the Norwegian flag-poles that marked the radius of the pole-encircling, which Scott mistook for the Norwegian marker of the pole. Both British and Norwegian observations appearing to lie so close together, the British expedition leader concluded: "There is no doubt that our predecessors have made thoroughly sure of their mark and fully carried out their programme" (Scott 2008, 377). Scott's misunderstanding thus indicated how the several landmarkers that the Norwegian expedition left could also frustrate the efforts to inscribe knowledge into things.

5. Tables of Data/Recalculating Observations

The Norwegian attempt to integrate the British expedition into their strategies to verify their success by turning them into eye-witnesses of the Norwegian success was not the last technique to prove their achievement. The geographical public still needed to be convinced that Amundsen's expedition had carried out accurate observations – Scott's affirmation at that time was still buried with him in a tent in the Antarctic. Indeed, the first press reports hinted that it was Scott and not Amundsen who had first reached the pole, although they were quickly proven wrong. The data that the Norwegians had generated on their journey and around what they claimed to be the South Pole, needed authoritative confirmation by European scholars and the geographical community. The object that was supposed to produce the evidence for the Norwegian accom-

plishment was Amundsen's journal, in which he had collected the results of all observations undertaken. Apart from Scott's eye-witness account, the notebook was the only "possibility for some traces of the travel to go back to the place that sent the expedition away" (Latour 1987, 218), a device that carried the inscriptions of their epistemic practices.

The most prominent institution involved in the process of evaluating the Norwegian claims was the London *Royal Geographical Society*, which invited, as indicated, Amundsen to read a paper on his expedition. The event produced bitter feelings on both sides: The society considered Amundsen's behaviour unfair: He had announced an Arctic expedition and only revealed his plans when on Madeira. Yet the society considered it impossible not to invite the person that had achieved the deed that it had proposed to be the greatest geographical endeavour that still needed to be undertaken. Amundsen on the other side felt insulted – an interesting aside regarding human-animal relations –, when the president of the society announced at the dinner that welcomed Amundsen that he would almost wish to bring out a toast to Amundsen's dogs, which played such an important role in the Norwegian expedition (Amundsen 1927).

While Amundsen, even years later, considered this an affront, he felt less insulted by the British enquiries concerning his data. After Amundsen had handed in the manuscript for his lecture, to give just one example, the society officials wrote back, inquiring into the Norwegian's method of converting kilometres into miles. Amundsen learnt from this and later gave distances both in miles and kilometres for the crucial parts of the English translation of his travel report. To underline the propriety of the results of his observations, Amundsen handed the journals, in which he had kept the expedition's record and noted down the results of all observations undertaken, on to Hans Geelmuyden, professor of astronomy, and director of the observatory of the university in Christiania. Geelmuyden did not calculate the astronomical observations himself, but instead handed them on to Anton Alexander, whom he called "a mathematical master." Alexander had participated in the recalculation of the results of Fridtjof Nansen's *Fram*, as well as Amundsen's earlier *Gjöa* expedition. From this, Geelmuyden claimed he knew that Alexander "was not only a reliable and painstaking calculator, but that he also has so full an insight into the theoretical basis," (Geelmuyden in Amundsen 1912b, 399) that he could complete the task without further instructions.

Alexander's examination showed that the observations of the Norwegian expedition had been taken very accurately. For the first polar camp, where the expedition left the sledge for the British expedition to find, and which the members of the expedition had, after eighteen observations, determined to be at 89° 54' southern latitude, Alexander argued that it might be assumed "with great certainty that this station lies between lat. 89° 52' and 89° 56' S" (Alexander in Amundsen 1912b, 400). While being very certain concerning the latitude, Alexander explained that in high latitudes, determining the longitude

was significantly more difficult, and "aberrations are very considerable." He therefore concluded that the camp must have been "between long. 90° and 120° E" (Alexander in Amundsen 1912b, 400). Based on these calculations, he drew a field within which the Polar station most probably lay.

At this camp, the variation of the compass was determined by a series of observations, and from these, Alexander argued, the absolute direction of the last day of the southern journey – the final five and a half miles travelled toward the pole – could be deduced. This data allowed Alexander to give a first approximation as to the location of Polheim: Analogically to the field in which the first camp lay, he constructed a square field for the final polar camp. Taking into consideration the observations undertaken during twenty-four hours at Polheim, and possible errors of the instruments and atmospheric anomalies, Alexander assumed that "a latitude of 89° 58' 6'' […] must be nearly correct" (Alexander in Amundsen 1912b, 402). Lastly, accounting for the disturbances that may have occurred, Alexander gave another approximation: "It results that Polheim must lie south of 89° 57', while at the same time we may assume that it cannot lie south of 89° 59'" (Alexander in Amundsen 1912b, 402). Further calculations led Alexander to the conclusion that "the probable position of Polheim may be given roughly as lat. 89° 58' 5'' S., and long. 60° E" (Alexander in Amundsen 1912b, 402).

Alexander's further procedure is interesting, because it calls into question generalized arguments concerning the power inscribed in maps. In parallel to the strategy of the Norwegian encircling of the pole, Alexander, after recalculating the data, also refrained from claims at exactitude. While the expedition had encircled a plain in which the South Pole most probably lay, Alexander's calculations resulted in illustrations of polar plains that indicated where the Norwegian expedition most probably had been. Alexander's chart showed two fields: The first displayed the field within which Polheim must lie, deduced from the position of the first polar camp, plus the following march. The second indicated the Polheim area, calculated from the observations taken at this camp. All that Alexander allowed himself to do, was to indicate in this chart "the probable position of Polheim" (Alexander in Amundsen 1912b, 402). The map in this case, was a carefully constructed argument in a campaign to establish the Norwegian presence at the pole as a matter of fact.

For the geographical and wider public, Alexander's final judgement of the Norwegian expedition was more important than his calculations and weightings of possibilities. This he drew from the position of Polheim he considered most probable. If this position was correct, the Norwegian south polar camp lay "one and a half geographical miles, or barely three kilometres, from the South Pole, and certainly not so much as six kilometres from it" (Alexander in Amundsen 1912b, 402f). Alexander's estimation of the final march that two explorers undertook from Polheim in the direction of the pole was even more satisfying for the Norwegians: "[I]f the assumed position of Polheim be correct, […] it is

very probable that they passed the actual Pole at a distance of a few hundred metres, perhaps even less" (Alexander in Amundsen 1912b, 403). Amundsen valued the weight of this proof of his proximity to the South Pole, and sent a translation of Alexander's report to the *Royal Geographical Society*. He further reproduced it as a section entitled "The astronomical observations at the pole" among other appendices dealing with the scientific results of the expedition at the end of his travel report.

6. Photographs at the Pole/Illustrating Presence

One last means of documenting the Norwegian presence at the pole only emerged when the British explorers were found. Toward the end of the nineteenth century, photography became an important medium in the European exploration of the world. As images of faraway places, drawings, and paintings could now be replaced by the photograph – "a signature of a particular scene, a specific and localized representation" (Daston and Galison 1992, 98). In European Antarctic exploration, frequent use was made of this medium, with several expeditions returning with masses of images. In Great Britain, Herbert Ponting won considerable fame as South Polar photographer (Arnold 1969). In other parts of the world, it may easily be imagined how photographs could function as proof that the explorers visited certain landscapes (Maxwell 2000; Hight and Sampson 2002). On the south polar plateau, however, this strategy was confronted with the problem that there were no distinctive visual features that could authorise the visit at the South Pole.

Yet Scott's expedition also served the Norwegians in this respect. The fate of the members of the British sledging journey to the South Pole is well known: Its members died on the return journey, running out of provisions, caught in a blizzard only miles short of the next depot. Part of the British expedition remained in the Antarctic for another winter to embark on search expeditions once the weather improved. On 12 November, the tent in which Scott, Bowers, and Edward Wilson had died, was found, and with them their letters, journals, and photographs. In the final message that he left, Scott wrote that the members of the southern journey "should have had a tale to tell of the hardihood, endurance, and courage," if they had survived the expedition. With the prospect of death, Scott delegated this task: "These rough notes and our dead bodies must tell the tale" (Scott 2008, 422).

They did, however, not only tell the story of the British expedition, but also fulfilled the Norwegian hopes in an affirmation of their success. Not only did Scott's journal confirm Amundsen's narrative, he also had the letter to the Norwegian king with him. Further, visual evidence for the Norwegian presence at the Pole was found in the British tent. Wilson had drawn a sketch of the flagpole the British considered the Norwegian marker for the South Pole, and one

of the photographic plates that the British had with them showed them standing around the tent at Polheim (Scott 2008, 377-81). As the Norwegian expedition had also taken a photograph of its members looking at the flag on top the Polheim tent, and both expeditions acknowledged that this tent was at least very close to the Geographical South Pole, this could be taken as an authoritative affirmation of the Norwegian claims.

7. Conclusion

In December 1911, Amundsen reached the South Pole. This piece of information, to return to the introduction, has become an accepted 'matter of fact' for historians and the broader public interested in the history of polar exploration. In this article, an attempt has been made to regard this 'matter of fact' as an example for 'ready-made geography,' a *black box* that needs to be opened to see how this brief sentence was established as a 'matter of fact.' To do so, an attempt was made to take into consideration 'geography in the making': The strategies and practices through which geographical facts were generated. A first result of this focus on practices that produce knowledge is that the statement that Amundsen reached the South Pole would need some modification: Rather than claiming to have been at the exact location of the Geographical South Pole, the Norwegian expedition encircled an area in which they assumed from their instrumental observations the pole to lie. This seems to be a decidedly more defensive claim aimed at the highest possible accuracy of measurements. At the same time, it stands in contrast to the symbolic flag-raising and claiming of the polar plateau that the expedition performed as soon as they felt close enough to the pole.

To come back to the practices of producing geographical 'matters of fact,' two further observations seem important. Firstly, the expedition did not rely on a single strategy, but combined practices based on instrumental measurements with approaches aiming at authoritative witnesses of their performance. While the former was the accepted methodology of generating scientific facts at the end of the nineteenth century, the former referred back to much older traditions. Bringing both strategies together indicates the difficulties of ascertaining facts in polar conditions: Witnesses could verify the results of observations, and give an authoritative judgement on performances in an almost completely inaccessible region of the world. The prestige that was attached to the success of erasing the last blank spot on the map surely added to the need to confirm the Norwegian accomplishment.

Secondly, a focus on practices reveals the complex interactions between the physical environment, human actors, and the instruments and other objects they used in order to generate knowledge. It is especially the influence the physical surroundings had on observational practices and possibilities that highlight the

importance of the categories of place and objects in processes of knowledge generation: If it was too cold, liquid in the Norwegian compasses froze, when clouds blocked the view of the sun, the location of the expedition could not be determined. The environment itself, it might be argued, was a decisive factor in the choice of epistemic practices the expedition could perform. This does not mean playing human agency off against material and spatial agency. Yet it seems necessary to pay close attention to the places and objects involved in processes of knowledge production: Materiality and place, the example of the Antarctic has shown, limit the seemingly endless number of possible courses of action open to human actors to a very few.

Lastly, considering the influence of the objects and places on knowledge generation, and the practices explorers performed to generate geographical 'matters of fact' in the context of the European exploration of the world, might challenge views that primarily focus on the outcome of these strategies. To the European public, the Antarctic expeditions at the end of the long nineteenth century were presented as heroic deeds of male endurance (Farley 2005; Glasberg 2012). To look at 'geography in the making' calls into question this image: It shows maps that were not designed to exercise power, but to convince geographers that an expedition has been at the place it claims to have been. The image of the heroic deed of traversing a hostile landscape is expanded by the difficult and sometimes fruitless attempts of determining with some certainty the expedition's position. Geography, just like the natural sciences, a focus on practices of knowledge production shows, was a discipline characterised by uncertainties, controversies, and negotiations.

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